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SUMMARY

The Expansion of ARAC for Toxic Chemical Releases

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TOPIC AREA: Emergency response decision making systems

For 20 years, the Atmospheric Release Advisory Capability (ARAC) program at Lawrence Livermore National Laboratory (LLNL) has supported the Department of Energy (DOE) in response to major hazardous releases into the atmosphere. As a centralized U.S. federal resource, ARAC'S primary role has been with incidents involving nuclear material. However, the program has also been asked to model non-radiological releases such as toxic chemical spills (Richmond, Calif. oleum spill in 1993), fires (Kuwaiti oil fires in 1991), and volcanic ash clouds (Mt. Pinatubo in 1991). The ARAC modeling system is designed to produce a consequence analysis anywhere in the world using real-time meteorological data to initialize a suite of complex 3-D numerical dispersion models which include terrain effects. Employing a high degree of automation expert assessors can complete a simulation and fax or electronically send plots to emergent y response managers in less than 15 minutes.

In 1996 the ARAC system was enhanced to provide a similar degree of automation for toxic chemical releases as with the nuclear events. The approach was to rely on existing robust public-domain software. Key components of new capability include the integration AIChE DIPPR chemical property database, the CAMEO ALOHA source modeling for tanks and evaporating pools, the SLAB denser-than-air dispersion code, and contour plots using the AIHA Emergency Response Planning Guidelines (ERPGs) and the DOE SCAPA Temporary Emergency Exposure Limits (TEELs). A Motif-based user interface provides quick access to databases and source modeling and associated consistency checks for the calculations.

The value of a centralized modeling capability versus a stand-alone desk-top modeling system is discussed in light of the short time and limited scale of most toxic releases and expertise to use the system. The ability to interpolate meteorological conditions at the accident scene is one of the most powerful tools of a centralized system. Consequently the system is useful for facilities without on-site meteorological data or for transportation accidents. In addition, complex models can more accurately simulate releases which last for several hours or longer, involve forecasted meteorological conditions, extend vertically into the atmosphere, are influenced by terrain driven or complex flows. Experience with recent events has shown that a centralized system can be beneficial for major chemical spills, fires or explosions.

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